WHAT IS CLAIMED IS:

1. An array antenna system having an electrically large array antenna, comprising:

a first antenna subarray;

a second antenna subarray;

a combination transmission line network having an input for receiving an antenna power signal, and a first output connected to emit a first output signal to the first antenna subarray, and a second output connected to emit a second output signal to the second antenna subarray; Sol Jan 30, 2002

a phase shifting device for generating a phase displacement between the first and second output signals before they are fed to the antenna subarrays; and

apparatus for compensating the phase displacement in the beam path of the antenna radiation emitted by the first and second antenna subarrays.

2. The array antenna system according to Claim 1, wherein the array antenna comprises at least two equally large antenna subarrays.

3. The array antenna system according to Claim 2, wherein:

the first antenna subarray forms a first half-antenna of the array antenna; and

the second antenna subarray forms a second half-antenna of the array antenna.

4. The array antenna system according to Claim 1, wherein the phase shifting device generates a phase displacement 90°.

5. The array antenna system according to Claim 4, wherein the apparatus for compensating the phase displacement causes a displacement between the radiation emitted by the first and second antenna subarrays in a main beaming direction by a quarter of a wavelength in the sense of a compensation of the 90° phase displacement generated by the phase shifting device.

6. The array antenna system according to Claim 1, wherein the antenna subarrays are mutually displaced with respect to a main beaming direction of the antenna.

7. The array antenna system according to Claim 6, wherein the antenna subarrays are arranged perpendicular to the main

beaming direction of the antenna, and are mutually displaced by a quarter of a wavelength.

8. The array antenna system according to Claim 6, wherein:

the antenna subarrays are arranged diagonally to the main beaming direction of the antenna; and

the centers of the antenna subarrays are mutually displaced by a quarter of the wavelength with respect to the main beaming direction.

9. The array antenna system according to Claim 8, wherein the antenna subarrays are arranged in a common plane.

10. The array antenna system according to Claim 1, wherein the antenna subarrays are covered by dielectric layers of different dielectric constants, which compensate the phase displacement of the radiation emitted by the antenna subarrays.

11. The array antenna system according to Claim 10, wherein the dielectric layers have a layer thickness (d) that causes a displacement between the radiation emitted by the antenna subarrays by a quarter of a wavelength in the sense of a compensation of the 90° phase displacement generated by the phase shifting device.

12. The array antenna system according to Claim 10, wherein the antenna subarrays are arranged in a common plane.

13. The array antenna system according to Claim 10, wherein a first dielectric layer is air, and a second dielectric layer is a layered medium with a dielectric constant that is larger than the dielectric constant of air.

14. The array antenna system according to Claim 1, wherein waveguide paths with different cross-sectional dimensions are arranged on the antenna subarrays, which cross-sectional dimensions compensate the phase displacement of the radiation emitted by the first and second antenna subarrays.

15. The array antenna system according to Claim 14, wherein the waveguides have a difference (d) in length which causes a relative displacement of the radiation emitted by the antenna subarrays by one quarter of a wavelength in the sense of a compensation of the 90° phase displacement generated by the phase shifting device.

16. The array antenna system according to Claim 14, wherein the antenna subarrays are arranged in a common plane.

17. The array antenna system according to Claim 14, wherein

at outputs of the waveguide paths, transition paths are provided with a transition from a narrow cross-section to a wide cross-section.

18. The array antenna system according to Claim 1, wherein the antenna subarrays are electrically large in a direction of a division between the subarrays.

19. The array antenna system according to Claim 18, wherein the antenna subarrays are small in a direction perpendicular with respect to the division.

20. The array antenna system according to Claim 1, wherein reflection factors of the first and second antenna subarrays are identical.

21. The array antenna system according to Claim 1, wherein the combination transmission ~~line~~ network contains a 4-port ~~gate~~ power splitter. Sof

22. The array antenna system according to Claim 21, wherein the 4-port ~~gate~~ power splitter comprise one of a Wilkinson splitter, a 3-dB directional coupler and an E-H waveguide double-T junction ~~branching~~. Sof Cof Jan 30, 2002

23. A method of operating an array antenna system having an electrically large array antenna that includes first and

second antenna subarrays and a combination transmission line network that has Sof Jan 30, 2002 first and second outputs connected to emit signals to the first and second antenna subarrays respectively, said method comprising:

introducing a phase shift into the signal emitted from said combination line network to one of said first and second antenna subarrays, creating a phase displacement between the signals input to the first and second antenna subarrays;

compensating the phase displacement by modifying relative physical characteristics of said first and second antenna subarrays.

24. The method according to Claim 23, wherein said phase displacement is approximately 90°.

25. The method according to Claim 24, wherein said compensating step comprises providing a mutual displacement of the first and second antenna subarrays relative to a beaming direction of the antenna.

26. The array antenna system according to Claim 25, wherein the antenna subarrays are arranged perpendicular to the main beaming direction of the antenna, and are mutually displaced by a quarter of a wavelength.

27. The array antenna system according to Claim 25, wherein:

the antenna subarrays are arranged diagonally to the main beaming direction of the antenna; and

the centers of the antenna subarrays are mutually displaced by a quarter of the wavelength with respect to the main beaming direction.

28. The method according to Claim 24, wherein said compensating step comprises covering said first and second antenna subarrays with dielectric layers having different dielectric constants.

29. The array antenna system according to Claim 28, wherein the dielectric layers have a layer thickness (d) that causes a displacement between the radiation emitted by the antenna subarrays by a quarter of a wavelength in the sense of a compensation of the 90° phase displacement generated by the phase shifting device.